Our Reference: KPS-100-B PATENT

AIR DUCT REGISTER

[0001] This application claims priority of Provisional Patent Application 60/463,701 filed on April 17, 2003.

FIELD OF THE INVENTION

[0002] The present invention relates to air duct registers, in particular to air duct registers installed into ceilings for the purpose of heating, cooling and ventilating areas.

BACKGROUND OF THE INVENTION

[0003] Air conditioning and/or heating ducts are often installed above the ceiling in buildings. The supply and return ducts are generally disposed above the level of the ceiling whether it is a sheet rock (gypsum board) ceiling, or a suspended ceiling or any other type ceiling. These main supply and return ducts usually communicate with the interior of the room through vent assemblies that are supported by the ceiling material or within a framed section of a suspended ceiling. Installing the air duct registers in above described ceiling applications can be very difficult, time consuming and frustrating for the installer.

[0004] One problem associated with securing a register to the end of a duct is the securing of the register to the ceiling material or to the suspended ceiling material. One reason for this problem is that ceiling materials such as sheet rock, thin paneling, or plaster are generally incapable of securely holding a fastener which holds the register in place in the ceiling. Over time the ceiling material weakens and eventually breaks apart or splinters.

[0005] Another problem encountered is the actual connection of the ductwork to the air duct register. Once the ceiling is in place, the installer is working blindly to connect the end of the duct with the register.

SUMMARY OF THE INVENTION

[0006] It is the intent of the present invention to provide an air duct register that addresses the aforementioned concerns.

[0007] According to the invention, an air duct register is provided for use in a finished ceiling in a room for connection to a flexible duct located above the ceiling. In one aspect of the invention, the air duct register includes a manifold housing

adapted for connecting to the flexible duct wherein the housing provides a fluid passageway from the duct to the room. The air duct register also includes a ceiling clamp operably associated with the manifold housing for attaching the manifold housing within a hole of the ceiling wherein the ceiling clamp has an actuator accessible from below the finished ceiling.

[0008] In another aspect of the invention, the air duct register includes a removable manifold collar releasibly attachable to the manifold housing and also releasibly attachable to the flexible duct.

[0009] In another aspect of the invention, the manifold housing has a first access opening at one end of the housing positionable in the hole in the ceiling and a second access opening in a sidewall of the housing positioned 90° from the first access opening and wherein the removable manifold collar is releasibly attachable to the housing within the second access opening.

[0010] In yet another aspect of the invention, the air duct register further includes a rotatable door releasibly attachable to the manifold collar wherein the door is positionable between a fully open and a fully closed position for regulating the air through the passageway formed by the manifold.

[0011] The present invention provides for a tool-free installation of the air manifold diffuser for adding air movement, exhausting air, or balancing air pressure in a room. The present invention can be used for new construction as well as retrofit applications.

[0012] Other applications of the present invention will become apparent to those skilled in the art when the following description of the best mode contemplated for practicing the invention is read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein:

[0014] Figure 1 is a schematic view of an air duct register according to the present invention installed in a ceiling;

[0015] Figure 2 is a perspective view of a manifold of the present invention having a clamp assembly for the air duct register;

[0016] Figure 3 is a perspective view of the clamp assembly;

[0017] Figure 4 is a perspective view of a duct collar for the air duct register;

[0018] Figure 4a is an elevational view of the rear wall of the duct collar;

[0019] Figure 5 is a perspective view of a grille or diffuser for the air duct register;

[0020] Figure 6 is a perspective view of an end of a duct connecting to the duct collar;

[0021] Figure 7 is a schematic view of a second embodiment of the air duct register having a rectangular configuration;

[0022] Figure 8 is perspective view of a rotating door connectible to the duct collar in the partially open position;

[0023] Figure 9 is a perspective view of the duct collar having the rotating door in the closed position connected thereto; and

[0024] Figure 10 is a perspective view of a fully assembled air duct register without the optional door.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0025] Referring to one aspect of the invention, Figure 1 shows an air duct register 10 for installation in a finished ceiling 12 is shown therein. The finished ceiling 12 can be made of sheet rock (gypsum board), thin paneling plaster, or other conventional material. The air duct register 10 is provided for connection to a flexible or rigid duct 14 located above the ceiling 12. The air duct register 10 receives conditioned air from the flexible duct 14 and channels the conditioned air through a grille or diffuser 16. Figures 2 - 5 and Figure 8 show components for the air duct register of the present invention. The air duct register 10 includes a manifold 18 having a clamp assembly 20 connected thereto. The air duct register 10 of the present invention also includes a duct collar 22 as well as the grille or diffuser 16. The duct collar 22 may optionally include a revolving or rotating door 24 as shown in Figures 8 and 9. The aforementioned components are made of plastic material to

provide a lightweight, inexpensive air duct register that improves air flow, reduces sound and lowers static pressures.

[0026] Referring next to Figures 2 and 3, there is shown the manifold which consists of a housing 26 having an essentially dome-shaped configuration. The dome-shaped housing 26 has a flange 28 extending around the periphery of the housing. The outer periphery 30 of the flange 28 is used as a template for marking the required hole in the ceiling as will be discussed further hereinafter. The inner periphery 32 of the flange 28 defines a first access opening 32 to the interior 34 of the dome-shaped housing 26. The housing 26 also has a side access aperture 36 sized and configured for receiving the duct collar 22 therein. The side access aperture 36 is located 90° relative to the flange 28 and the first opening 32.

[0027] A pair of clamp assemblies 20 are located 180° from each other and located on each side of the side access aperture 36. Portions of the clamp assemblies 20 are shown in Figure 2 and a single enlarged clamp assembly 20 is shown in Figure 3. The ceiling clamp assembly 20 is operable for clamping the ceiling 12 between the flange 28 of the manifold 18 and the clamp assembly 20. The clamp assembly 20 includes a clamp guide 38, a thumb cam 40 having an integrally threaded stem 42 and a ceiling clamp 44. The clamp guide 38 is integrally formed with the housing 26. The clamp guide 38 forms a path for the integrally threaded stem 42; and is positioned around the stem 42 for keeping the ceiling clamp assembly 20 in a rotationally fixed position relative to the thumb cam 40. The ceiling clamp 44 is threadingly engageable with the integrally threaded stem 42 such that when the thumb cam 40 is rotated in one direction, the ceiling clamp 44 moves closer to the thumb cam 40. When the thumb cam 40 is rotated in the opposite direction, the ceiling clamp 44 moves away from the thumb cam 40. The ceiling clamp 44 can only move axially away from and toward the thumb cam 40. The threaded stem 42 has an unthreaded portion 46 positioned adjacent to the thumb cam 40 and located within an aperture of the base 48 of the clamp guide 38 and through the flange 28. Therefore the thumb cam 40 is located on the opposing side of the flange 28 from the clamp guide 38 so that the thumb cam 40 is visible and accessible to the installer from below the ceiling 12. The thumb cam 40 is a flat circular disc having a rigid

edge to facilitate the installer to manually turn the cam without the use of a tool. The unthreaded portion 48 has a small lip 50 positioned above the base 48 to maintain the thumb cam 40 with its integral threaded stem 42 in position within the clamp guide 38. Each ceiling clamp 44 has a wing 43 which extends away from the stem 42. As the thumb cam 40 is rotated, the wing 43 rotates relative to the stem 42 as the ceiling clamp moves axially along the stem 42 to place the wing 43 in engagement with the ceiling material for securing thereto. The wing 43 may also have teeth 45 along its lower edge for further gripping into the ceiling material.

[0028] Figures 4, 4a, 6, and 9 show the removeable duct collar 22. As will be explained hereinafter, the duct collar 22 provides a mounting means for connecting the flexible or rigid duct 14 to the air duct register 10. The duct collar 22 includes a circular flange 52 extending from a wall 54 of the duct collar 22. The flange 52 defines a center through opening. The circular flange 52 has at least one but preferably a plurality of retainer barbs 56 for holding the flexible or rigid duct 14 onto the duct collar 22 without the need for a hose clamp or other separate tool. Inset from each retainer barb 56 along the periphery of the circular flange 52 are small apertures 58 for receiving clips to hold an optional door 24, as will be discussed further hereinafter. A second wall 60 integrally connected to a first wall 54 and positioned 90° relative to the first wall 54 has a semi-circular configuration for corresponding to the domed exterior configuration of the housing 26. The peripheral edge of the second wall 60 forms a groove 62 for receiving a pair of ledges 37 that extend in the side aperture 36 of the housing 26. A central clip 64 formed in the center of the peripheral edge of the second wall 60 of the collar 22 corresponds for latching into a cutout 35 formed between the pair of ledges 37 in the manifold housing 26. Positioning the pair of ledges 37 within the groove 62 and attaching the clip 64 into the cutout 35 cooperates to secure the duct collar 22 within the side aperture 36 of the housing 26.

[0029] The circular flange 52 of the collar 22 defines a circular passageway to allow regulated air to be moved between the room and the air duct 14 via the manifold housing and collar 22. The passageway formed by the circular flange 52 may optionally be opened or closed by a door assembly 66. The door assembly 66 is

best shown in Figure 8. The door assembly 66 includes a ring 68 defining a central passageway therebetween and a circular planar door 24 sized so that the door 24 closes the passageway through the ring 68. The door 24 has pins 72 extending from the circumferential sides of the door and positioned 180° from each other. The pins are rotatably held to the ring and maintained in position in a gate 74 located adjacent to each pin 72. The door 24 is movable to rotate 90° from a fully closed position through a fully open position. The door assembly 66 is connected to the duct collar 22 by means of tabs 76. As shown in Figure 4a, the inner side of the first wall 54 has a circumferential recess 80 concentric with the circular flange 52. The circumferential recess 80 is sized for receiving the ring 68 of the door assembly 66. The recess 80 has a plurality of through slots 58 for receiving the tabs 76 of the door assembly 66. To properly align the door assembly 66 within the recess 80, the recess includes a rib 82 for alignment with a corresponding slot 84 in the outer surface of the ring 68. Figure 9 shows the door assembly 66 assembled to the duct collar 22 with the door 24 closing the passageway. As also shown in Figure 9, a supporting rib 53 may be integrally formed along the first wall 54 of the collar 22 from the circular flange 52 to the second wall 60 to provide additional strength to the collar 22.

[0030] The air duct register 10 of the present invention further includes a grille or diffuser 16. The grille or diffuser 16 is shown in Figures 1 and 5. The grille 16 includes a plurality of spring clips 86 for releasably attaching the grille to the manifold housing 26. The grille 16 covers the first access opening 32 of the manifold housing 26. The grille 16 also includes a plurality of vent openings 88 for passing the conditioned air from the flexible or rigid duct 14 into the room.

[0031] The air duct register 10 can be easily installed into any finished ceiling 12. The flange 28 of the housing 26 can be used as a template for sizing a hole to be cut into the ceiling 12. The cut for the hole 17 should be approximately 1/4 inch inside the template circle. The round manifold housing 26 is inserted through the cutaway portion 17 of the ceiling 12 positioning the first access opening 32 parallel to the ceiling 12. The round manifold housing 26 has a flange 28 having a perimeter 22 with a larger diameter than the round manifold housing 26. The flange 28 is positioned adjacent the finished ceiling 12 when the air manifold assembly 10 is fully

installed. The flange 28 prevents the air manifold assembly 10 from completely passing through the cutaway portion 17 of the ceiling 12. The clamp assembly 20 for releasably locking the air manifold assembly housing 26 with respect to the finished ceiling 12 is accessible from underneath the ceiling 12 by reaching up to the exposed thumb cams 40 of the clamp assembly 20. The thumb cams 40 can be tightened manually by hand or with a use of a screw driver in the screwdriver slot 90. By tightening the thumb cams 40, the ceiling clamps 44 rotate into engagement with the ceiling material while the teeth 45 grip into the ceiling material.

[0032] Once the housing manifold 18 is installed in the ceiling 12, the duct 14 is brought through the manifold 18 via the side access opening 36 and through the first or lower access opening 32. The duct 14 is then attached to the air manifold collar 22, as shown in Figure 6. The removable manifold collar 22 is then fed back up through the lower access opening 32 and attached to the side access opening 36 as discussed supra.

[0033] Finally, the grille 16 is releasably snap-locked onto the flange 28 of the manifold housing 26. Figure 10 shows an assembled air duct register 10 without the door assembly 66.

[0034] The air duct register of the present invention is designed to maximize air flow performance over more conventional sheet metal designs. By utilizing plastic materials and injection molding processes it is possible to radius and smooth the shape of the 90° passageway in the manifold 18 which improves air flow, reduces sound and lowers static pressures.

[0035] The air duct register of the present invention is further designed with the do-it-yourself home owner handyman in mind. The air duct registers is designed for ease of installation requiring no tools to assemble. The air duct register can be installed into drywall, drop, wood or any finished standard or cathedral ceiling with a minimum clearance of 7-1-1/2 inches from ceiling to top of joist. Once ducting is attached, the duct collar 22 and grille 16 can be connected and assembled from the bottom up. There is no need to crawl into attic or ceiling to attach clamps or duct elbows.

[0036] The air duct register of the present invention can also be used in compliance to building codes requiring balancing of room-to-room air pressures. Two or more units can be connected together to improve room-to-room imbalanced HVAC system air pressures.

[0037] While the invention has been described in connection with what is presently considered to be the most practical and preferred embodiment, it is to be understood that the invention is not to be limited to the disclosed embodiments but, on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims, which scope is to be accorded the broadest interpretation so as to encompass all such modifications and equivalent structures as is permitted under the law. One such variation is shown in Figure 7, where the manifold housing 26 has a rectangular shape with a corresponding shaped first access opening 32.